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Subject: Evaluation of Western Dwarf Mistletoe for the Four Corners Project  
(NE96-15)

To: District Ranger, Hat Creek Ranger District

Western dwarf mistletoe, (Arceuthobium campylopodum = DM) infests many of the ponderosa pine trees in the Four Corners Project Area. This parasitic plant spreads within and between trees by means of a unique fruit which shoots sticky seeds up to 60 feet or more from the flower. DM weakens the pine by removing water and nutrients. The heavier the infestation, the more susceptible the tree becomes to the effects of drought and bark beetle attack. Numerous infection centers occur in the Four Corners area. Severity of infection ranges from light to heavy in these centers. If left untreated, the DM will spread from tree to tree as well as intensify within a tree. It is thought that fire played an historic role in controlling DM by killing whole trees and/or individual branches heavily infected with the disease. It must be mentioned that DM can provide wildlife and aesthetic benefits to stands in the form of cover and food for some animals and visual diversity.

DM does not have to be completely removed from the pine stands, in order to create "healthy stands". Mature pine trees can grow well with light DM infestations, especially if the infections are lower in the crown. Upward spread of DM in a tree is slow, and pine on better sites can grow in height faster than the DM can spread up the crown. Since the pine in the Four Corners area are generally growing on poorer sites, DM can spread throughout the crowns and weaken the infected pine by slowing growth. Heavily infected trees will have poor survival during periods of drought and bark beetle attack.

The DM Severity Rating System

Dwarf mistletoe infests ponderosa pine in random locations throughout the Four Corners project area. The levels of DM infections range from light to severe. A six-point DM severity rating system, known as "the Hawksworth rating" is commonly used to quantify DM infection. The Hawksworth rating is determined by visually dividing the live crown of a tree into horizontal thirds. Each third is given a score of "one" if DM is present in one half and "two" if DM is in both halves. The scores of the three sections are added to give a DM rating for the tree. A score of "one" means the DM infection is light and present in 1/6 of the tree crown. A score of "six" means the DM infection is severe and present throughout the crown of the tree.

### Treatment of DM Infections

Pine with heavy DM infections have higher mortality rates than healthy trees. If this increased mortality does not meet with the management objectives of the area, then the disease should be treated. Tree removal and branch pruning are two methods of treatment that can be used to control infections. Both are appropriate in the Four Corners Area.

Pine with light DM infections (DM ratings of 1,2 or 3) generally do not require treatment. Trees with heavy infections (DM ratings of 4,5 or 6) should be treated. Removal of trees with heavy DM infections is usually the most economical treatment. Alternatively, DM infected branches can be pruned from some pine with heavy DM infections and reduce the severity of the disease on those trees.

In the Four Corners Project Area, I recommend removing all DM infected pine where the trees are not needed for stocking or other management objectives. Where tree retention is necessary, the most vigorous trees with the least DM should be left. If the DM rating of a leave tree is 4 or greater, prune DM infected branches to remove all DM or lower the DM rating below 4.

Usually, the DM infection is confined to the lower crown in larger trees and infected branches can be easily removed. Where branch pruning is the selected treatment, prune all DM infected branches that are not needed for tree survival (retain at least 1/3 of the total tree height in live crown). A small tree with DM in the top should be removed, unless all the DM infected branches can be pruned without killing the tree.

Seven small stands (approximately 43 acres) of pine with severe DM infections have been located in the Four Corners Project. Removal of all the pine with heavy DM infection will leave these areas understocked. Since pine will be regenerated here, all DM should be removed from leave trees in and within

100 feet of these regeneration stands. This is necessary to prevent DM seed from infecting the healthy seedlings that will be growing in the openings.

The DM disease cycle includes a period of six or more years when infected branches show no visible sign of the disease. This is while the disease is developing in a branch and before the DM begins to grow outside the bark when it becomes visible. Because of these "latent" infections, it is impossible to prune all the infected branches from the host trees. It is necessary to return in

ten years to prune the branches with latent infections, if all the DM is to be removed from an area. This second treatment is necessary in all areas where host seedlings will be regenerated, to prevent the seedlings from being infected.

#### Other Diseases - Boraxing Stumps

Annosus root disease can be introduced into healthy pine root systems when the fungal spores infect freshly cut stumps. To prevent the introduction of this root disease, I recommend treating all pine stumps with diameters greater than 12 inches with a borate compound when the trees are felled. The current borate compound approved for this purpose is Sporax.

Armillaria root disease is sometimes present in the roots of old oak trees. This disease coexists with the oaks rather well. However, when infected oaks are cut, the disease can become activated and move into surrounding conifers. For this reason, consider retaining large oaks. When thinning an oak clump (growing from the same root system), leave sufficient oak stocking to maintain a living root system.

#### Summary

The Four Corners Project Area contains many ponderosa pine trees infected with dwarf mistletoe. This parasite is capable of spreading within and between host trees at a slow but steady rate. If left untreated, this disease will intensify and weaken infected trees and cause increased mortality. The recommended treatment is tree removal. Branch pruning can also be effective. Pruning should only be used where trees must be retained to meet management objectives. All dwarf mistletoe should be removed within 100 feet of regeneration areas. Pine stumps, greater than 12 inches in diameter, should be treated with Sporax. Please contact Bill Woodruff, 257-2151 with questions or for more information.

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